

TERRITORY OF AMERICAN SAMOA INTEGRATED WATER QUALITY MONITORING AND ASSESSMENT REPORT 2004



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I Overview

The American Samoa Environmental Protection Agency (ASEPA) has a responsibility to monitor, assess, and protect water quality for the Territory of American Samoa. U.S. federal and American Samoa local environmental legislation and regulations all apply in American Samoa.

This report has been prepared to satisfy the listing requirements of Section 303(d) and the reporting requirements of Section 305(b) and 314 of the Clean Water Act. This 305(b) report is the principal means by which ASEPA, Congress, and the public evaluate whether territorial waters meet water quality standards, the progress made in maintaining and restoring water quality, and the extent of remaining problems. Water quality and associated data from fiscal year 2003 (FY2003) were used to complete this report.

i Geographical Summary

The Territory of American Samoa lies roughly 14 degrees south of the equator between longitude 169 and 173 west and about 2,300 miles southwest of Hawaii. The principal islands are Tutuila, Aunu'u, and the Manu'a islands (a cluster of three islands, Ta'u, Ofu and Olosega, located about 65 miles east of Tutuila). Swains Island, a small island with a population of less than 25 and Rose Atoll, an uninhabited atoll about 120 miles east of Tutuila make up the remainder of the territory. The population of the territory was 57,291 people in the year 2000, of which ca. 97% live on the island of Tutuila.

The islands of American Samoa are volcanic in origin and exhibit the rugged topographic relief common to the Pacific volcanic islands. The climate of the territory is tropical, with uniform high temperatures and high humidity throughout the year. Mean daily temperature during the year varies from about 78 to 82 degrees Fahrenheit. The maximum altitude is about 3,180 ft. above mean sea level at the summit of Lata Mountain on Ta'u Island. Tutuila, with an area of 53 square miles, is the largest island in the territory. It is approximately 20 miles long and ranges in width from less than one mile, to a maximum of 5 miles at the Tafuna-Leone plain. A sharp-crested ridge 1,000 to 2,000 feet high with steeply eroded slopes dominates the entire length of the island.

The steep, variable topography of Tutuila effects localized rainfall amounts. The airport at Tafuna receives about 125 in. (3,180 mm) but Pago Pago receives nearly 200 in (4,090 mm). The crest of the range at Mt. Alava, altitude 1,600 ft. (914 m), receives considerably more than 250 in (6,350 mm). The driest months are June through September and the wettest are December through March, but heavy showers can occur in any month. The 1999 revision of the American Samoa Water Quality Standards (ASWQS) describes six water classifications for the territory: Fresh Surface Waters, Ground Waters, Wetlands, Embayments, Open Coastal Waters, and Ocean Waters.

ii Territorial Water Quality Review

Fresh Surface Waters

The small, steep watersheds and periodic intense rainfall cause highly variable flows in the nearly 260 miles of American Samoa's perennial streams. Despite these highly variable flows, the streams of American Samoa support a variety of aquatic species, several of which may be harvested for consumption. Designated uses include potable water supplies, support of indigenous wildlife, and aesthetic and recreational enjoyment. Stream water quality is most affected by development along a stream that changes the hydrology and shade along a stream, by development within a watershed that causes erosion and increased turbidity, and by nutrient pollution from poorly constructed human and pig waste disposal systems. In some areas, improved service by sewage lines and subsequent decrease in the number of poorly constructed septic systems has improved stream water quality.

The majority of the drinking water for the population is from ground water sources provided by the government system. However, there are five outlying villages that continue to use surface water diversions as a source of drinking water.

Ground Waters

The Tafuna-Leone plain is the site of the majority of American Samoa's residential and business development. The plain is also the site of the majority of the wells that pump ground water for distribution. Because volcanic stratum of Tutuila is highly permeable and does not have a great capacity to filter, there is a constant risk of groundwater contamination as pollution migrates from the surface with rainwater. The greatest threats to groundwater quality in American Samoa are pesticide residues, pollutants associated with automobiles, and pathogen and nutrient pollution from poorly constructed human and pig waste disposal systems. As in many small tropical islands with highly permeable soils, the fresh water aquifer floats on a layer of salt water beneath the ground. Rare dry periods of two- to three-months duration can result in critical drinking water shortages as salt water intrudes on the depleted fresh water lens. The territory suffered its worst drought of historical record in 1974. In 1998 the Territory experienced a drought, but not as severe as the 1974 drought, and there was not a noticeable increase in chlorides in the drinking water.

Wetlands

American Samoa possesses a number of small but very important wetland habitats. The wetlands include coastal mangrove swamps, inland freshwater marshes and some cultivated *taro* fields. Designated uses include support of indigenous aquatic and terrestrial life, fishing, food cultivation and gathering, recreation, flood control and groundwater recharge. Wetlands in the territory are being lost or degraded by urban growth and development as a result of population increase. Biosystems Analysis, in their wetlands management plan, calculated that between 1961 and 1990, 23 percent of American Samoa's wetlands have been lost.

Ocean Shoreline

American Samoa has nearly 150 miles of coastline. Fringing coral reefs that surround all of the islands in the territory characterize the embayments and ~~Open Coastal Waters~~ open coastal waters of American Samoa. Designated uses include fishing and food gathering, recreation, support of marine life, mariculture, and scientific investigations. The reefs also provide a buffer for the islands against the impact of waves. The greatest threats to near-shore water quality and to the health of the reefs in American Samoa are from run off from the land, especially pathogen and nutrient pollution from poorly constructed human and pig waste disposal systems as well as increased turbidity and nutrients from erosion. Solid waste, i.e. improperly disposed of trash, is another source of pollution in open coastal waters and embayments.

Pago Pago harbor is the most industrialized embayment in the Territory, with over a century of development subsequent to the creation of the Territory under the United States. As well as the sources of water quality impairments mentioned above for embayments in general, Pago Pago Harbor is eaffected by pollution from marina and port traffic, a small shipyard, and in the outer harbor effluent from the tuna canneries and sewage treatment plant, ~~both~~ hall of which have National Pollutant Discharge Elimination System (NPDES) permits. Due to the segregation and transportation of cannery waste beyond the inner harbor, better treatment of sewage, and more effective monitoring and prosecution by the Coast Guard of commercial vessels that pollute the harbor, the water quality in the inner harbor has greatly improved in the last decade.

There are special management areas within the Territory's open coastal waters including Fagatele Bay National Marine Sanctuary, the Territorial Marine Park on Ofu and the National Park, Ofu segment.

Designated uses of open ocean waters include fishing, scientific investigations, boating, support of marine life, and recreation. While there is a small offshore fishery, it is unknown whether offshore waters are affected by pollution. High strength wastes (high solids, high nitrogen, high phosphorus) from the tuna canneries are dumped in a designated zone approximately five miles offshore. Monitoring shows that the waste has no more than a localized effect.

II Background

i Total Waters

Table 1. Atlas Description of American Samoa

Topic	Value
Territorial Population	57,291*
Territory Surface Area (square miles)	76.1
Total Miles of Streams (miles)	258
Square Miles of Coral Reef	184
Miles of Ocean Coast	149
Acres of Fresh Water and Tidal Wetlands	508

*From 2000 Census

ii Maps

The Territory of American Samoa is divided into 41 watershed units to simplify management of aquatic resources. Maps with watershed delineations are presented in Appendix B, Figures 1 and 2.

iii Water Pollution Control Program

A. Watershed Approach

The total surface area of American Samoa is very small, only 76.1 sq. miles. This small surface area is divided into 41 watersheds, each with an average size of 1.8 sq. miles (Appendix B, Table 1, Figures 1 and 2). Water quality monitoring, along with coral / fish / benthic monitoring covers 33 out of the 41 watersheds, and also covers >95% of the population of American Samoa. Accordingly, tracking water quality on a watershed scale is fully adequate to meet our monitoring objectives and goals.

B. Point Source Program

There are only seven identified point sources in the Territory. These sources include: Starkist, Samoa Packing COS, Utulei Waste Water Treatment Facility, Tafuna Waste Water Treatment Facility, British Petroleum, Satala Power Plant, and Southwest Marine. Analysis of NPDES monitoring data confirms that these facilities meet the requirements established by individual NPDES permits, and these point sources have negligible impact on water quality. What few violations there are usually are short-term isolated incidents.

C. Nonpoint Source Control Program

American Samoa has determined that all threatened or impaired designated uses in the Territory are due to nonpoint sources (NPS). Therefore, watersheds identified as threatened or impaired are considered areas where NPS management measures have not improved water quality in the coastal zone. Threatened and impaired watersheds are targeted for enhanced management measures and water quality monitoring.

In FY03, program effort was directed towards completion of requirements towards full approval of The American Samoa Coastal Nonpoint Pollution Control Program (ASCNPCP) and implementation of the required monitoring strategy. Full approval was received July 24, 2003. When fully implemented, the program is expected to control nonpoint sources and achieve the requirements of the Clean Water Act.

iv Cost/Benefit Assessment

Following are the approximate economic and social costs and benefits of actions necessary to achieve the objective of the Clean Water Act.

Costs:

- Capital investments in municipal facilities in the past 5 years: 9 million dollars
- Capital investments in municipal facilities in the past 10 years: 14 million dollars
- Capital investments in municipal facilities since 1972: 34 million dollars
- Capital investments in industrial facilities in the past 5 years: 1.5 million dollars
- Capital investments in industrial facilities in the past 10 years: 3.5 million dollars
- Capital investments in industrial facilities since 1972: 10 million dollars
- Investments in nonpoint source measures in the past 5 years: 500 thousand dollars
- Investments in nonpoint source measures in the past 10 years: 800 thousand dollars
- Investments in nonpoint source measures since 1972: 800 thousand dollars
- Annual operation and maintenance costs of municipal facilities: 0.6 million dollars
- Annual operation and maintenance costs of industrial facilities: 3.5 million dollars
- Total annual costs of municipal and industrial facilities: 4.1 million dollars
- Annual costs to government to administer water pollution control activities: 1.1 million dollars.

Benefits Information

Benefits to the territory include the protection of the groundwater that supplies the majority of the drinking water for the Territory, the improved quality of Pago Pago Harbor, which has improved recreational and aesthetic enjoyment as well as habitat, and the protection of fringing coral reefs from pollution. The coral reefs around American Samoa are used recreationally and supply much of the fresh fish and seafood for the territory. The reefs also provide a buffer for the islands against the impact of waves.

v Special Territorial Concerns and Recommendations

Most special concerns in American Samoa are related to geographical aspects of the islands and cultural aspects of the Samoan people. The main concern is the pressure that the growing population in American Samoa is exerting on natural resources and the local environment. During the past ten years the population of the territory has increased by 16,300 people, an explosive increase of 35 percent. The population will reach 100,000 people within the next 20 years. There is a very limited land base to accommodate this growth. Only one third of Tutuila contains land that is suited for human development (ie. only 19 square miles have a slope of less than 30%). Development factors such as construction, overfishing, and increased solid waste and sewage will impact groundwater, streams, and coastal waters.

While local environmental education has made great strides in the last decade, there is still a widespread lack of understanding of environmental issues that eaffect the Territory. The need to control litter is understood, but the effect of less obvious pollution from piggeries, soil erosion, automobiles and untreated sewage is not clearly comprehended. There is a lack of political and public will to enforce poorly understood environmental regulations. The regulations themselves are quite comprehensive, but are not seen as a priority for enforcement.

The Malaeimi valley in central Tutuila has been determined to be a major recharge area for the Tafuna-Leone aquifer, which supplies the majority of the drinking water for the Territory. This valley has been proposed as a Special Management Area, and it is critical that the development in the area is carefully controlled to protect groundwater resources.

Lastly, the unique coral reef habitat that characterizes the fringing reefs of American Samoa merits special concern. Modern development, leading to road construction, increased solid waste and sewage, and sedimentation, has caused much indirect stress to the coral reefs, while overfishing has directly impacted the reef environment. The concern worldwide for the health and protection of coral reefs is mirrored here in American Samoa. This has led to directed management and research efforts on how to best protect reef habitats.

III Surface Water Assessment

i. Current Surface Water Monitoring Program

A. Monitoring Program Description

American Samoa has identified the following monitoring objectives to insure our monitoring program is efficient and effective in generating data that serve all management needs:

1. To help establish water quality standards for all types of Territorial waters
2. To determine water quality status and trends for all types of Territorial waters
3. To make designated use support determinations and identify impaired waters for all types of Territorial waters
4. To identify causes and sources of water quality problems for all types of Territorial waters
5. To evaluate the effectiveness of Non Point Source Best Management Practices for restoring impaired designated uses for all types of Territorial waters
6. To evaluate the effectiveness of NPDES permits

ASEPA has developed a Territorial Monitoring and Assessment Program that includes the 10 elements recommended by USEPA. The program incorporates an efficient combination of monitoring plans and strategies to meet all monitoring objectives. The plans/strategies include fixed station, intensive and screening level monitoring, judgmental, and probability designs. Monitoring plans and strategies include:

1. ASEPA Nearshore Marine Water Quality Monitoring Plan
2. ASEPA Stream Water Quality Monitoring Plan
3. American Samoa Ocean EMAP
4. ASEPA Intensive Coral Reef and Reef Flat Monitoring Plan
5. Water Quality Monitoring Strategy for Pago Pago Harbor, American Samoa
6. Sediment Toxicity Study for Pago Pago Harbor, American Samoa
7. American Samoa Coastal Nonpoint Source Monitoring Strategy
8. ASPA Drinking Water Systems Water Quality Monitoring Plan

B. Monitoring Schedule

Waters that will be monitored and assessed during the next 2-year integrated report cycle includes:

Streams New stream systems will be assessed according to the plan outlined in the ASEPA Stream Water Quality Monitoring Plan. This plan utilizes a probabilistic approach to select streams for assessment and monitoring.

Ocean Shoreline Swimming resources will continue to be monitored according to the ASEPA Nearshore Marine Water Quality Monitoring Plan. In addition, ASEPA will begin to monitor marine water quality with the new American Samoa Ocean EMAP. Coral reefs will be monitored with the ASEPA Intensive Coral Reef and Reef Flat Monitoring Plan.

Wetlands No new wetland assessments will be conducted in the period leading up the next integrated report.

ii. Status of Plan to Achieve Comprehensive Assessments

~~The most recent water quality monitoring strategy was complete~~ The expanded ASEPA Territorial Water Quality Monitoring and Assessment Program was designed to be statistically rigorous and to satisfy USEPA guidelines for water quality monitoring programs. All categories of water bodies directly monitored by agency efforts were depicted and inventoried in the program. Sampling locations were georeferenced with GPS as a collaborative effort with the American Samoa Coastal Management Program (ASCMP). ASCMP is leading an effort to create a Territorial GIS and has the technical staff and equipment to incorporate georeferenced data into that GIS. ~~All of these new sampling~~

The Recreational Beach Monitoring Program and the Stream Monitoring Program were created to lead to comprehensive monitoring in these aquatic habitats. The beach monitoring visits 42 recreational beach locations in American Samoa, and 16 of these beaches are monitored at a weekly frequency. This monitoring effort provides excellent coverage for local beach recreational areas. The stream monitoring program is based on a probabilistic model, where a small population of streams are selected at random from the overall population and monitored for 1 year. After that period, a new population of streams will be selected at random for monitoring. Over 3-4 years, the stream monitoring

data will provide a robust assessment of stream water quality in American Samoa. Other programs, including the new American Samoa Ocean EMAP and the ASEPA Intensive Coral Reef and Reef Flat Monitoring Plan program, will monitor ocean water quality and coral reef health, and will allow the Territory to achieve comprehensive assessments with the limited resources available.

iii. Assessment Methodology

A. Assessment Methodology

1. The 2004 305b Report

ASEPA assembled and evaluated all existing and readily available data and information from sampling and analyses completed in FY2003, including data and information relating to the categories of waters specified in 40 CFR§130.7(b)(5).

Sources for data for the 2004 report include:

1. ASEPA Stream Monitoring Program
2. ASEPA Beach Monitoring Program
3. ASEPA/ASPA Groundwater Monitoring Program
4. ASPA NPDES Receiving Waters Monitoring (conducted by CH2MHill)
5. Joint Cannery NPDES Receiving Waters Monitoring (conducted by CH2MHill)
6. ASCC/Land Grant Stream Study (Don Vargo, Ph. D.)
7. World Wildlife Fund/Emerald Coast Environmental Consulting Coral Bleaching Study
8. ASEPA Tier II Fish Toxicity Study
9. National Park Service research project (with University of Hawaii) in Ofu Lagoon
10. Wetland Assessment by AS Department of Commerce/Land Grant

For this 2004 report, multiple uses based on current water quality standards have been assessed. The primary uses for water bodies in the territory are:

1. Potable water supplies
2. Support and propagation of indigenous aquatic and terrestrial life
3. Compatible recreation and aesthetic enjoyment
4. Fish and Shellfish consumption

Specific criteria for determining attainment of these individual uses have been incorporated in accordance with the federal guidance Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates (USEPA 1997) and are described below in detail.

2. Assessment Information

The primary unit of assessment used by ASEPA for this 305(b) report is the watershed. As indicated previously, the total surface area of American Samoa is very small, only 76.1 sq. miles. This small surface area is divided into 41 watersheds, each with an average size of 1.8 sq. miles (Appendix B, Table 1, Figures 1 and 2). Water quality monitoring, along with coral / fish / benthic monitoring covers 33 out of the 41 watersheds, and also covers >95% of the population of American Samoa. Accordingly,

tracking water quality on a watershed scale is fully adequate to meet our monitoring objectives and goals.

Because the watershed is the primary assessment unit, ASEPA recognizes that data from several locations within a watershed need to be reconciled before assessing the overall use support of waters within that watershed. To this end, ASEPA chose to err on the conservative side. When multiple sources of data within one watershed indicated different levels of use support, we chose the least supporting level for the entire watershed.

Two types of assessment information were utilized: “Evaluated” and “Monitored”. “Evaluated waters” are those for which the use support decision is based on information other than site-specific ambient data. This includes data on land use, location of sources, and best professional judgment of qualified biologists. “Monitored waters” are those for which the use support decision is principally based on current, site-specific, ambient monitoring data believed to accurately portray water quality conditions. The majority of the assessments in the 2004 report utilize monitored data; however, wetland assessments relied principally on the best professional judgment of trained wetland biologists. Wetlands, then, were evaluated waters.

Each source of ALUS data, whether “evaluated” or “monitored” is assigned a Data Quality Level in accordance with the federal guidance Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates (USEPA 1997). Data types are grouped into four categories: biological, habitat, toxicological, and physical/chemical. The rigor of a method within each data type is dictated by its technical components, spatial/temporal coverage, and data quality (precision and sensitivity). Level 4 data are of the highest quality for a data type and provide relatively high level of certainty. Level 1 data represent less rigorous approaches and thus provide a level of information with greater degree of uncertainty. An example of a sheet summarizing the data level for information used in a 2004 assessment is given in Appendix C.

3. Guidelines for Determining Levels of Use Support for Primary Uses.

3.1 Potable Water Supplies

There are five village systems in outlying areas that continue to use surface water for drinking water supply. The guidance provided in the federal 305(b) guidelines was used to make use determinations. Monitoring of the village systems to ensure compliance with the Safe Drinking Water Act (SDWA) provides the best data related to use restrictions, including:

- Contamination-based drinking water supply advisories lasting more than 30 days per year; and
- Public water suppliers requiring increased monitoring due to confirmed detections of one or more contaminants.

The following table, taken from the federal guidelines, illustrates the assessment framework used to make use support decisions.

Table 3. Assessment Framework for Determining Drinking Water Use Support

Classification	Monitoring Data		Use Support Restrictions
Full Support	Contaminants do not exceed water quality criteria	and/or	Drinking water use restrictions are not in effect.
Full Support but Threatened	Contaminants are detected but do not exceed water quality criteria	and/or	Some drinking water use restrictions have occurred and/or the potential for adverse impacts to source water quality exists.
Partial Support	Contaminants exceed water quality criteria intermittently	and/or	Drinking water use restrictions resulted in the need for more than conventional treatment with associated increases in cost.
Nonsupport	Contaminants exceed water quality criteria constantly	and/or	Drinking water use restrictions resulted in closures.
Unassessed	Source water quality has not been assessed for contaminants used or potentially present.		

3.2 Support and Propagation of Indigenous Aquatic and Terrestrial Life

Of the four data type categories (biological, habitat, toxicological and physical/chemical), two categories, physical/chemical and habitat, were used during this reporting period for Aquatic Life Use Support (ALUS) determination. These data are of varying data quality levels as per the hierarchy of data levels for evaluation of aquatic life use attainment of the 1997 305(b) EPA guidance. The guideline for determining ALUS using more than one type of data is shown in Table 4 below.

Table 4. Determination of ALUS Using More Than One Data Type

ALUS Attainment	
Fully Supporting:	No impairment indicated by all data types.
Fully Supporting but Threatened:	No impairment indicated by all data types; one or more categories indicate an apparent decline in ecological quality over time or potential water quality problems requiring additional data or verification or other information suggest a threatened determination.
ALUS Non-Attainment	
*Partially Supporting:	Impairment indicated by one or more data types and no impairment indicated by others.
*Not Supporting:	Impairment indicated by all data types.
*A determination of <i>Partially Supporting</i> or <i>Not Supporting</i> could be made based on the nature and rigor of the data and site-specific conditions in the results of the data types. If bioassessment (usually Level 3 or 4) indicates impairment, then a determination of <i>Not Supporting</i> should be made.	

i. Physical/Chemical Methods

Analytical parameters analyzed by ASEPA include Temperature, Salinity, Conductivity, pH, Dissolved Oxygen, and Turbidity. These parameters were assessed by the criteria developed by the USEPA for the “Conventional Category”. Much of ASEPA’s Physical/Chemical data is considered Low/Moderate quality, based on technical components and spatial/temporal coverages, as defined by Table 3-4 in the 1997 EPA guidance document Hierarchy of Physical/chemical Data Levels for Evaluation of Aquatic Life Use Attainment. The ASWQS provides standards for these parameters presented in Table A1 (Appendix A).

USEPA guidance (1997) states the importance of incorporating the established criteria for conventionals and toxicants in ALUS determinations and to use the “worst case” approach where multiple parameters are available (USEPA, 1997). Tables 5 and 6 below, describe the decision guidelines used for determining ALUS using Physical/Chemical Methods (conventional data and toxicant data).

Table 5. Decision Guidelines for Conventional (and additional parameters) Used to Assess ALUS in Freshwater Rivers and in Marine Waters

Degree of Aquatic Life Use Support	Criteria
Fully Supporting	For any one pollutant, ASWQS exceeded in ≤ 10 percent of measurements.
Partially Supporting	For any one pollutant, ASWQS exceeded in 11 to 25 percent of measurements.
Not Supporting	For any one pollutant, ASWQS exceeded in > 25 percent of measurements.

Table 6. Decision Guidelines for Toxicants (priority pollutants, metals, chlorine and ammonia) Used to Assess ALUS in Freshwater Rivers and in Marine Waters

Degree of Aquatic Life Use Support	Criteria
Fully Supporting	For any one pollutant, no more than 1 exceedance of acute criteria within a 3-year period based on grab or composite samples and no more than 1 exceedance of chronic criteria within a 3-year period based on grab or composite samples
Partially Supporting	For any one pollutant, acute or chronic criteria exceeded more than once within a 3-year period, but in ≤ 10 percent of samples.
Not Supporting	For any one pollutant, acute or chronic criteria exceeded in > 10 percent of samples.

ii. Habitat Assessment and Bioassessment

In FY2003, the ASEPA stream monitoring program included a habitat assessment that provided data of Low Quality, as defined by Table 3-2 in the 1997 EPA guidance document Hierarchy of Physical/chemical Data Levels for Evaluation of Aquatic Life Use Attainment. No bioassessment data were collected during this period.

Guidelines from the USEPA guidance (1997) for ALUS determination using habitat assessment data are provided in Table 7 below.

Table 7. ALUS Determination Based on Habitat Assessment Data

Degree of Aquatic Life Use Support	Criteria
Fully Supporting	Reliable data indicate natural channel morphology, substrate composition, bank/riparian structure, and flow regime of region. Riparian vegetation of natural types and of relatively full standing crop biomass (i.e., minimal grazing or destructive pressure).
Partially Supporting	Modification of habitat slight to moderate usually due to road crossings, limited riparian zones because of encroaching land-use patterns, and some watershed erosion. Channel modification slight to moderate.
Not Supporting	Moderate to severe habitat alteration by channelization and dredging activities, removal of riparian vegetation, bank failure, heavy watershed erosion or alteration of flow regime.

Table 8. ALUS Determination Based on Bioassessment Data

Degree of Aquatic Life Use Support	Criteria
Fully Supporting	Reliable data indicate functioning, sustainable biological assemblages (e.g. fish, macroinvertebrates, or algae) none of which has been modified significantly beyond the natural range of the reference condition.
Partially Supporting	At least one assemblage (e.g. fish, macroinvertebrates, or algae) indicates moderate modification of the biological community compared to the reference condition.
Not Supporting	At least one assemblage indicates nonsupport. Data clearly indicate severe modification of the biological community compared to the reference condition.

Data levels for the three data type categories were ranked according to the hierarchy provided in the USEPA guidance (1997).

3.3 Recreation and Aesthetic Enjoyment

The current ASWQS lists fecal coliform as the microbiological indicator for fresh surface waters and *Enterococci* as its indicator for microbiological quality in marine waters.

Microbiological criteria used to determine use support for waters designated for whole body contact recreation are depicted in Table 10 below. This is consistent with recommendations from the 1997 EPA guidance.

3.4 Fish and Shellfish Consumption

Based on the results of a USEPA/ASEPA Tier II Fish Toxicity study, the fish consumption advisory continues to exist for fish and shellfish in the inner Pago Pago harbor. The USEPA guidance document (1997) provided classification hierarchy for use support status based on fish/shellfish consumption advisory data as depicted in Table 9 below.

Table 9. Fish/Shellfish Consumption Use Support Determination Based on Advisory Data

Degree of Aquatic Life Use Support	Criteria
Fully Supporting	No fish/shellfish restrictions or bans are in effect.
Partially Supporting	“Restricted consumption” of fish in effect. Restricted consumption is defined as limits on the number of meals or size of meals consumed per unit of time for one or more fish/shellfish species. Or, a fish or shellfish ban in effect for a subpopulation that could be at potentially greater risk, for one or more fish/shellfish species.
Not Supporting	“No consumption” of fish or shellfish ban in effect for general population for one or more fish/shellfish species, or commercial fishing/shellfishing ban in effect.

Table 10. Whole Body Contact Recreation (all surface and marine water designations)

Level of Recreation Use Support	Criteria			
	Fresh Surface Water	Ocean Waters	Embayments: Pago Pago Harbor, Fagatele Bay, Pala Lagoon	All Other Embayments, Open Coastal Waters
Fully Supporting	<u>Fecal coliform</u> : The single sample density does not exceed 200 cfu/100mL AND a geometric mean does not exceed 100 cfu/100mL.	<u>Enterococci</u> : A geometric mean of 35 enterococci per 100mL is not exceeded AND the single sample density does not exceed 276 enterococci per 100mL.	<u>Enterococci</u> : A geometric mean of 35 enterococci per 100mL is not exceeded AND the single sample density does not exceed 104 enterococci per 100mL.	<u>Enterococci</u> : A geometric mean of 35 enterococci per 100mL is not exceeded AND the single sample density does not exceed 124 enterococci per 100mL.
Partially Supporting	<u>Fecal coliform</u> : The single sample density of 200 cfu/100mL is exceeded during the year AND a geometric mean does not exceed 100 cfu/100mL.	<u>Enterococci</u> : The single sample density of 276 cfu/100mL is exceeded during the year AND a geometric mean does not exceed 35 cfu/100mL.	<u>Enterococci</u> : The single sample density of 104 cfu/100mL is exceeded during the year AND a geometric mean does not exceed 35 cfu/100mL.	<u>Enterococci</u> : The single sample density of 124 cfu/100mL is exceeded during the year AND a geometric mean does not exceed 35 cfu/100mL.
Not Supporting	<u>Fecal coliform</u> : The geometric mean standard of 100 cfu/100mL is not met.	<u>Enterococci</u> : The geometric mean standard of 35 cfu/100mL is not met.	<u>Enterococci</u> : The geometric mean standard of 35 cfu/100mL is not met.	<u>Enterococci</u> : The geometric mean standard of 35 cfu/124mL is not met.

4. Guidelines for Determining Consolidated Assessment and Listing Methodology (CALM) Categories

The Consolidated Assessment and Listing Methodology (CALM) categories for the 2004 report were determined from the Consolidated Assessment and Listing Methodology: Toward a Compendium of Best Practices Guidance (2002). Each water body type was assigned a CALM category, based on the following descriptions.

- Category 1 Water body meets all designated uses. No use is impaired.
- Category 2 Water body meets some of the designated uses. There is insufficient data to evaluate any remaining designated uses.
- Category 3 There are insufficient data to evaluate any designated uses.
- Category 4a Water body is impaired for one or more designated uses, but a TMDL has already been prepared and completed.
- Category 4b Water body is impaired for one or more designated uses, but a TMDL is not necessary because other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.
- Category 4c Water body is impaired for one or more designated uses, but a TMDL is not necessary because a pollutant does not cause the impairment.
- Category 5 Water body is impaired, and a TMDL is required [303(d) list].

In this report, waters that were assessed as Fully Supporting but Threatened (Threatened) were not considered impaired. Instead, ASEPA regards threatened waters to be “waters for which monitoring or evaluative data indicate potential water quality problems requiring additional data or verification.”(Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates, USEPA 1997). For instance, waters that had minor violations of the American Samoa Water Quality Standards (ASWQS) numeric criteria, or for which data were considered of low quality, or situations where too few samples precluded examining data with respect to the water quality standards, were considered Threatened. Waters assessed as Threatened are not expected to exceed WQS by the next listing cycle.

iv. Streams Water Quality Assessment

Using the guidelines presented above, American Samoa’s stream waters were assessed according to levels of use support. This information is presented in Tables A3 through A6 in Appendix A and summarized in Appendix C.

Several research groups, including ASEPA staff, gathered water quality data from streams in the Territory. The assessment of these data covers 207.4 miles out of 257.5 total stream miles (81%, Table A6). The Assessed Goals were to Protect and Enhance Public Health and Protect and Enhance Ecosystems. All other categories were either “Not Applicable” or “Applicable but no data was available” for this reporting period (Table A3). The Major Causes/Stresses identified for this reporting period were Nutrients, Organic Enrichment/Low DO, Habitat Alterations and Pathogen Indicators (Table A4). The Major assessed sources of impairment were Collection System Failure, Intensive Animal Feeding Operations, Habitat Modifications (not-hydromod), and an unknown

source, while the Moderate/Minor Sources of Impairment were Collection System Failure and Intensive Animal Feeding Operations (Table A5). Trend analyses will be developed as stream monitoring continues and data accrues.

For the goal Protect and Enhance Ecosystems (Aquatic Life), 200.2 stream miles were assessed. Of those miles, 22.1 were found to be “Fully Supporting”, 93.7 were found to be “Fully Supporting but Threatened”, and 6.5 miles were found to be “Partially Supporting”. For the goal to Protect and Enhance Public Health, 38.4 stream miles were assessed for drinking water and found to be “Not Supporting” (Table A3).

The following CALM categories were assigned based on the assessments for Aquatic Life Use Support and Drinking Water. Thirteen of 41 watersheds were placed in Category 2, while 8 of 41 were placed in Category 3. Five watersheds were classified as Not Supporting based on Drinking Water designated use. These watersheds were placed in Category 4b, because these village drinking water systems are under Administrative Order to be replaced with treated water from the central system within 2 years. For Aquatic Life Use Support, streams were determined to be impaired in only six watersheds. Streams in these watersheds were also placed in Category 4b because Best Management Practices (BMP) documented in the American Samoa Non Point Source Pollution Control Plan have just recently been fully implemented, and preliminary indications are that the Best Management Practices outlined in this plan will be effective in reducing nonpoint pollution and improving water quality to attain all water quality standards within 5 years.

v. Ocean Shoreline Assessment

Using the guidelines presented above, American Samoa’s ocean shoreline waters were assessed according to levels of use support. This information is presented in Tables A7 through A10 in Appendix A and summarized in Appendix C.

For this reporting period, the total sized assessed in shoreline miles was 83.4 (Table A10). The Assessed Goals were 1) Protection and Enhancement of Ecosystems (Aquatic Life) and 2) Protection and Enhancement of Public Health (Fish Consumption and Whole Body Contact Recreation/Swimming). All other categories were either “Not Applicable” or “Applicable but no data was available” for this reporting period (Table A7). The Major Causes/Stresses identified for this reporting period were PCBs and Pathogen Indicators, while Moderate/Minor Cause/Stressors included Metals (arsenic and mercury), Nutrients, Organic Enrichment/Low DO, Pathogen Indicators, and Turbidity (Table A8). The Major and Moderate/Minor sources of impairment (Table A9) were Collection System Failure, Agriculture, Intensive Animal Feeding Operations and Contaminated Sediments (major) and Unknown Sources (minor). Trend analyses will be developed as the territorial coral reef and marine monitoring program is implemented and data accrues.

For the goal Protect and Enhance Ecosystems (Aquatic Life) 14.7 assessed miles were found to be “Fully Supporting” and 27.5 miles were “Fully Supporting but Threatened”. For the goal to Protect and Enhance Public Health, 83.4 shoreline miles were assessed for

swimming. Of this total, 10.7 miles were “Fully Supporting,” 40.1 miles were “Partially Supporting,” and 32.6 miles were “Not Supporting” (Table A7). For the goal to Protect and Enhance Public Health, 37.4 shoreline miles were assessed for fish consumption and only 7.9 miles were found “Not Supporting” (Table A7).

The following CALM categories were assigned based on the assessments for Aquatic Life Use Support, Swimming, and Fish Consumption. Twelve of the 41 watersheds in American Samoa were given a CALM Category 2, while 28 watersheds received a Category 3 rating. In many cases, watersheds were placed in Category 3 despite ASEPA having made use support designations based on nearshore bacterial data. ASEPA did this because there are questions as to the appropriateness of the indicator (*Enterococci*) in tropical waters.

Recent research suggests that EPA’s recommended indicator bacteria, *E. coli* and enterococci, may not be appropriate indicators for assessing the risk of gastrointestinal illness in tropical recreational waters. *E. coli* and enterococci have been found in soils and waterbodies where site surveys have indicated that it is unlikely that the source of these bacteria has been human fecal contamination. . . . Because of this, the Hawaii Department of Health proposed *Clostridium perfringens* as an alternate indicator of human fecal contamination.

USEPA Implementation Guidance for Ambient Water Quality for Bacteria

Because of this question about the appropriateness of the indicator, ASEPA has decided not to use Category 5 but instead use Category 3 for waters for which there is an indication of fecal contamination until there is sufficient knowledge about the indicators to more accurately predict the source of the contamination. ASEPA desired to include as much information as possible about the waters of American Samoa in this report, but recognizes the questions surrounding the use of bacterial indicators in tropical waters. In addition, local BMP efforts documented in the American Samoa Non Point Source Pollution Control Plan have just recently been fully implemented, and preliminary information indicates that the activities outlined in this plan will be effective in reducing nonpoint pollution and improving water quality conditions to attain all water quality standards for swimming within 5 years. Only one CALM rating of 5 was given for oceans, and this was based on a detailed Tier II Fish Toxicity Study. The resulting parameters of concern from this Tier II Study were PCBs and the metals arsenic and mercury. The subsequent risk assessment and remediation plan will be part of the TMDL.

vi. Wetlands Assessment

Using the guidelines presented above, American Samoa’s wetlands were assessed according to levels of use support. This information is presented in Tables A11 through A14 in Appendix A and summarized in Appendix C.

For this reporting period, the total wetland acres assessed was 438.9 (Table A14). The Assessed Goals were 1) Protection and Enhancement of Ecosystems (Aquatic Life) and 2) Protection of Social and Economic Uses. All other categories were either “Not Applicable” or “Applicable but no data was available” for this reporting period (Table A7). The Major Causes/Stresses identified for this reporting period was Habitat Loss

(Table A12). The Moderate/Minor Causes/Stresses include Metals, Nutrients, Siltation, Organic Enrichment/Low DO, Suspended Solids, and Turbidity. The Major Source of impairment was habitat modification, and Moderate/Minor sources of impairment included Agriculture, Intensive Animal Feeding Operations, Urban Runoff/Storm Sewers, and Habitat Modification (Table A13). No trend analyses will be conducted at this time as this is the first reporting period with data.

For the goal Protect and Enhance Ecosystems (Aquatic Life) 169.5 assessed acres were found to be “Fully Supporting,” 258.8 acres were found to be “Fully Supporting but Threatened,” and 10.6 acres were “Partially Supporting”. For the goal to Protect Social and Economic Uses (Agricultural), 315.4 acres were found to be “Fully Supporting,” 122.9 acres were found to be “Fully Supporting but Threatened,” and 0.6 acres were “Partially Supporting.” For the goal to Protect Social and Economic Uses (Cultural/Ceremonial), 307.4 acres were found to be “Fully Supporting,” 122.9 acres were found to be “Fully Supporting but Threatened,” and 8.6 acres were “Partially Supporting.” For the goal to Protect Social and Economic Uses (Recreational), 135.4 acres were found to be “Fully Supporting,” 258.8 acres were found to be “Fully Supporting but Threatened,” and 36.1 acres were “Partially Supporting.” (Table A11).

The following CALM categories were assigned to wetlands based on the assessments for Aquatic Life Use Support, Agriculture, Cultural/Ceremonial, and Recreation. All assessed wetlands were placed in CALM Category 3 (insufficient data). Assessments were determined by best professional judgment. ASEPA desired to include as much information as possible about the waters of American Samoa in this report, but recognizes the lack of precision of these evaluated data. Future quantitative data will confirm the status of local wetlands, at which time ASEPA would reclassify these aquatic habitats.

vii. Schedule for Establishing TMDLs

The only water body requiring a TMDL is Pago Pago Harbor (Ocean Shoreline) based on not meeting the Fish Consumption designated use. This was based on the results of a new Tier II Toxicity study. The associated risk assessment will be completed by September 30, 2004, at which time ASEPA will work with USEPA Region 9 to determine what if any TMDL will be necessary based on the results of that risk assessment.

IV Groundwater Assessment

Tables 11 to 13 report on the quality of the Tutuila, Ofu/Olosega and Ta'u aquifers that provide the majority of American Samoa's ground water resources. Table 11 provides an overview of the most important sources of ground water contamination. Best professional judgment provided the methodology and justification for prioritization of the sources indicated. In the same table, letters in the third column correspond with the following factors used to select each contaminant source.

- A. Human health and/or environmental risk (toxicity)
- B. Size of population at risk
- C. Location of sources relative to drinking water sources

- D. Number and/or size of contaminant sources
- E. Hydrogeologic sensitivity
- F. Territorial findings, other findings
- H. Geographic distribution/occurrence

As well, letters in the fourth column correspond with the contaminants/classes of contaminants considered to be associated with each of the sources that was checked.

- A. Inorganic pesticides
- B. Organic pesticides
- C. Halogenated solvents
- D. Petroleum compounds
- E. Nitrate
- G. Salinity/brine
- H. Metals
- I. Radionuclides
- J. Bacteria
- K. Protozoa
- L. Viruses

Table 12 provides a summary of American Samoa's ground water protection efforts. ASEPA and other cooperating government agencies have increased efforts to monitor and protect groundwater resources. The aquifer and drinking water/wellhead vulnerability assessment and comprehensive data management systems, under development in the last 2002 305(b) report, are now both fully established. In addition, interagency coordination for groundwater protection and the Pollution Prevention Program have also been fully established since the last 305(b) report. Table 13 provides and ground water contaminant summary for the Tutuila aquifer. Tables 14-21 provide the occurrence of particular groups of contaminants for each hydrogeologic setting in American Samoa.

Table 11: Major Sources of Ground Water Contamination, 2004.

Contaminant Source	Ten Highest Priority Sources	Factors Considered in Selecting a Contaminant Source	Contaminants
<i>Agricultural Activities</i>			
Agricultural chemical facilities			
Animal feedlots	x	A,B,C,D,E,G	E,J,K,L
Drainage wells			
Fertilizer applications	x	A,B,C,D,E,G	E,J,K,L
Irrigation practices			
Pesticide applications	x	A,B,C,D,E,G	A,B
On-farm agricultural mixing and loading procedures			
Land application of manure (unregulated)			
<i>Storage and Treatment Activities</i>			
Land application (regulated or permitted)			
Material stockpiles			
Storage tanks (above ground)			
Storage tanks (underground)	x	A,B,C,D,E,G	D
Surface impoundments			
Waste piles			
Waste tailings			
<i>Disposal Activities</i>			
Deep injection wells			
Landfills	x	A,E	A,B,C,D,E,H,I,J,K,L
Septic systems	x	A,B,C,D,E,G	E,J,K,L
Shallow injection wells			
<i>Other</i>			
Hazardous waste generators			
Hazardous waste sites			
Large industrial facilities			
Material transfer operations			
Mining and mine drainage			
Pipelines and sewer lines	x	A,B,C,D,E,G	E,J,K,L
Salt storage and road salting			
Salt water intrusion	x	A,B,C,D,E,F,G	G
Spills			
Transportation of materials			
Urban runoff	x	A,B,C,D,E,G	C,D
Small-scale manufacturing and repair shops	x	A,C,E,G	C,D,H
Other sources (please specify)			

Table 12: Summary of American Samoa's Ground Water Protection Programs, 2004.

Programs or Activities	Check	Implementation Status	Responsible State Agency
Active SARA Title III Program	x	under development	ASEPA/TEMCO
Ambient ground water monitoring system			
Aquifer vulnerability assessment	x	fully established	ASEPA/ASPA
Aquifer mapping	x	under development	ASEPA/ASPA
Aquifer characterization	x	under development	ASEPA/ASPA
Comprehensive data management system	x	fully established	ASEPA/ASPA
EPA-endorsed Core Comprehensive State Ground Water Protection Program (CSGWPP)	x	under development	ASEPA/ASPA
Ground water discharge permits			
Ground water Best Management Practices	x	under development	ASEPA/ASPA
Ground water legislation	x	fully established	ASEPA/ASPA
Ground water classification	x	under development	ASEPA/ASPA
Ground water quality standards	x	under development	ASEPA/ASPA
Interagency coordination for ground water protection initiatives	x	fully established	ASEPA/ASPA
Non point source controls	x	fully established	ASEPA/ASPA/DOC
Pesticide State Management Plan			
Pollution Prevention Program	x	fully established	ASEPA
Resource Conservation and Recovery Act (RCRA) Primacy			
Source Water Assessment Program			
State Superfund			
State RCRA Program incorporating more stringent requirements than RCRA Primacy			
State septic system regulations	x	fully established	ASPA/Public Health
Underground storage tank installation requirements	x	fully established	ASEPA
Underground storage tank remediation fund			
Underground storage tank permit program	x	fully established	ASEPA
Underground injection control program			
Vulnerability assessment for drinking water/wellhead protection	x	fully established	ASEPA/ASPA
Well abandonment regulations	x	fully established	ASEPA/ASPA
Wellhead Protection Program (EPA approved)	x	under development	ASEPA/ASPA
Well installation regulations	x	fully established	ASEPA/ASPA
Other programs or activities (please specify)			

Table 13: Ground Water Contamination Summary, 2004

Hydrogeologic Setting

Data Reporting Period

Source Type	Number of Sites	Number of sites that are listed and/or have confirmed releases	Number of sites with confirmed ground water contamination	Contaminants	Number of site investigations	Number of sites that have been stabilized or have had the source removed	Number of sites with corrective action plans	Number of sites with active remediation	Number of sites with cleanup completed
NPL	0								
CERCLIS (non-NPL)	0								
DOD/DOE	2	2	0	Petroleum	2	1	2	0	1
LUST	1	1	0	Diesel	1	1	1	0	1
RCRA Corrective Action	0								
Underground Injection	0								
State Sites	3	3	0	PCB, Petroleum	3	2	3	1	2
Non-Point Sources	0								
Other (specify)	0								

NPL - National Priority List

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

DOE - Department of Energy

DOD - Department of Defense

LUST - Leaking Underground Storage Tanks

Table 14. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting: Tutuila

Data Reporting Period: 2003 (calendar year)

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs		One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment 1	Background parameters exceed MCLs
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)						
Untreated Water Quality Data from Public Water Supply Wells		VOC										
		SOC										
		NO3										
		Other										
Finished Water Quality Data from Public Water Supply Wells	36	VOC	17	17	17	17	0	0	0	0	0	
		SOC	13	13	13	13	0	0	0	0	0	
		NO3	0	0	36	36	0	0	0	0	0	
		Other2	0	0	0	0	16	16	0	0	10	

¹ All groundwater wells required chlorination treatment.² Includes inorganic chemical contaminants only

Table 15. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting: Aoa

Data Reporting Period: 2003 (calendar year)

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs		One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment 1	Background parameters exceed MCLs
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)						
Untreated Water Quality Data from Public Water Supply Wells		VOC										
		SOC										
		NO3										
		Other										
Finished Water Quality Data from Public Water Supply Wells	1	VOC	0	0	1	1	0	0	0	0	0	
		SOC	0	0	1	1	0	0	0	0	0	
		NO3	0	0	1	1	0	0	0	0	0	
		Other2	0	10	0	0	1	0	0	1	0	

1 All groundwater wells required chlorination treatment.

2 Includes inorganic chemical contaminants only.

Table 16. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting: Fagasa

Data Reporting Period: 2003 (calendar year)

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs		One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment ²	Background parameters exceed MCLs
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)						
Untreated Water Quality Data from Public Water Supply Wells		VOC										
		SOC										
		NO ₃										
		Other										
Finished Water Quality Data from Public Water Supply Wells	1	VOC										
		SOC	1	1	1	1	0	0	0	0	0	
		NO ₃	0	0	1	1	0	0	0	0	0	
		Other ³	0	0	1	1	0	0	0	1	0	

1

2 All groundwater wells required chlorination treatment.

3 Includes inorganic chemical contaminants only.

Table 17. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting:

Masefau

Data Reporting Period:

2003 (calendar year)

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs		One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment ¹	Background parameters exceed MCLs
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)						
Untreated Water Quality Data from Public Water Supply Wells		VOC										
		SOC										
		NO ₃										
		Other										
Finished Water Quality Data from Public Water Supply Wells	1	VOC	1	1	1	1	0	0	0	0	0	0
		SOC	0	0	0	0	0	0	0	0	0	0
		NO ₃	0	0	1	1	0	0	0	0	0	0
		Other ²	0	0	0	0	1	0	0	1	0	0

1 All groundwater wells required chlorination treatment.

2 Includes inorganic chemical contaminants only.

Table 18. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting: Sa'ilele

Data Reporting Period: 2003 (calendar year)

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells								
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs	One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment 1	Background parameters exceed MCLs
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)					
Untreated Water Quality Data from Public Water Supply Wells		VOC									
		SOC									
		NO ₃									
		Other									
Finished Water Quality Data from Public Water Supply Wells	1	VOC	1	1	1	1	0	0	0	0	0
		SOC	1	1	1	1	0	0	0	0	0
		NO ₃	0	0	1	1	0	0	0	0	0
		Other2	0	0	0	0	1	0	1	1	1

¹ All groundwater wells required chlorination treatment.² Includes inorganic chemical contaminants only.

Table 19. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting:

Aunu'u

Data Reporting Period:

2003 (calendar year)

Data Reporting Period: 2005 (calendar year)												
Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs	One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment ¹	Background parameters exceed MCLs	
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)						
Untreated Water Quality Data from Public Water Supply Wells		VOC										
		SOC										
		NO ₃										
		Other										
Finished Water Quality Data from Public Water Supply Wells	3	VOC	3	3	1	1	0	0	0	0	0	0
		SOC	3	3	1	1	0	0	0	0	0	0
		NO ₃	2	2	1	1	0	0	0	0	0	0
		Other ²	0	0	0	0	3	0	0	3	3	3

1 All groundwater wells required chlorination treatment.

2 Includes inorganic chemical contaminants only.

Table 20. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting: Ofu/Olosega

Data Reporting Period: 2003 (calendar year)

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs		One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment 1	Background parameters exceed MCLs
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)						
Untreated Water Quality Data from Public Water Supply Wells		VOC										
		SOC										
		NO3										
		Other										
Finished Water Quality Data from Public Water Supply Wells	2	VOC	2	2	2	2	0	0	0	0	0	
		SOC	0	0	0	0	2	0	0	0	0	
		NO3	0	0	2	2	0	0	0	0	0	
		Other2	0	0	0	0	2	0	0	2	2	

¹ All groundwater wells required chlorination treatment.² Includes inorganic chemical contaminants only.

Table 21. Aquifer Monitoring Data, 2004.

Hydrogeologic Setting: Ta'u-Faleasao/Fitiuta

Data Reporting Period: 2003 (calendar year)

Data Reporting Period: 2005 (calendar year)												
Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l AND No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l OR Other parameters are detected at concentrations exceeding the MDLs but less than or equal to the MCLs		One or more parameters are detected at concentrations exceeding the MCLs	Number of Wells Removed from service	Number of wells Requiring Special Treatment ¹	Background parameters exceed MCLs
			N D	Number of wells in sensitive or vulnerable areas (optional)	Nitrate ≤ 5mg/l AND VOC, SOC, and other parameters not detected	Number of wells in sensitive or vulnerable areas (optional)						
Untreated Water Quality Data from Public Water Supply Wells		VOC										
		SOC										
		NO ₃										
		Other										
Finished Water Quality Data from Public Water Supply Wells	2	VOC	2	2	2	2	0	0	0	0	0	0
		SOC	1	1	1	1	1	0	0	0	0	0
		NO ₃	0	0	2	2	0	0	0	0	0	0
		Other ²	0	0	0	0	2	0	0	2	2	2

¹ All groundwater wells required chlorination treatment.² Includes inorganic chemical contaminants only

V Public Participation Process

As part of the integrated report process, ASEPA announced the completion of the Integrated Water Quality Monitoring and Assessment Report and solicited public comments over a 30-day period. The public announcements were advertised in a local newspaper, and the document was made available to any interested member of the public to review and provide comments. No comments were received.

I Appendix A

Table A1: Summary of American Samoa Water Quality Standards, 2004.

Parameters	Fresh Surface Waters	Embayments	Pago Harbor Embayment	Embayments (Fagatele Bay and Pala Lagoon)	Open Coastal Waters	Ocean Waters
Temperature	-not to deviate more than 1.5 °F from ambient and not to fluctuate more than 1 °F on an hourly basis or to exceed 85 °F (except when due to natural causes)					
Light Penetration Depth	not < 65.0 ft (to exceed given value 50% of the time)	not < 120.0 ft (to exceed given value 50% of the time)	not < 65.0 ft (to exceed given value 50% of the time)	not < 130.0 ft (to exceed given value 50% of the time)	not < 130.0 ft (to exceed given value 50% of the time)	not < 150.0 ft (to exceed given value 50% of the time)
PH	6.5-8.6 range (+/- 0.2 pH units of that which would naturally occur)	6.5-8.6 range (+/- 0.2 pH units of that which would naturally occur)	6.5-8.6 range (+/- 0.2 pH units of that which would naturally occur)	6.5-8.6 range (+/- 0.2 pH units of that which would naturally occur)	6.5-8.6 range (+/- 0.2 pH units of that which would naturally occur)	6.5-8.6 range (+/- 0.2 pH units of that which would naturally occur)
Dissolved Oxygen	not < 75% saturation or not <6.0 mg/L	not < 70% saturation or not <6.0 mg/L	not < 70% saturation or not <6.0 mg/L	not < 80% saturation or not <6.0 mg/L	not < 80% saturation or not <6.0 mg/L	not < 80% saturation or not <6.0 mg/L
Turbidity	not > 5.0 NTU	not > 0.35 NTU	not > 0.75 NTU	Fagatele Bay not >0.25 NTU; Pala Lagoon not >0.75 NTU	not > 0.25 NTU	Not > 0.20 NTU
Chlorophyll-a	N/A	not >0.5 ug/L	not >1.0 ug/L	not >0.35 ug/L	not >0.25 ug/L	not >0.18 ug/L
Enterococcus / Fecal coliform	Fecal coliform geometric mean not >100 CFU/100 ml and instantaneous sample not >200 CFU/100 ml	Enterococcus geometric mean not >35 CFU/100 ml and instantaneous sample not >124 CFU/100 ml	Enterococcus geometric mean not >35 CFU/100 ml and instantaneous sample not >104 CFU/100 ml	Enterococcus geometric mean not >35 CFU/100 ml and instantaneous sample not >104 CFU/100 ml	Enterococcus geometric mean not >35 CFU/100 ml and instantaneous sample not >124 CFU/100 ml	Enterococcus geometric mean not >35 CFU/100 ml and instantaneous sample not >276 CFU/100 ml

Table A2: Criteria for Priority Toxic Pollutants in Territorial Water Bodies from the ASWQS, 2004.

Water Body	Criteria
Class 1 Surface Waters and Class 1G Groundwater	The concentration of toxic pollutants shall not exceed the more stringent of the continuous concentration criteria for freshwater or the human health concentration criteria for the consumption of water and organisms found in the most recent publication of toxics criteria in 40 CFR Part 131.36(b), as amended.
Class 2 Surface Water and Wetlands	The concentration of toxic pollutants shall not exceed the more stringent of the continuous concentration criteria for freshwater or the human health concentration criteria for the consumption of organisms found in the most recent publication of toxics criteria in 40 CFR Part 131.36(b), as amended.
All Embayments, Open Coastal Waters and Ocean Waters	Except as may be allowed by the EQC within a Zone of Mixing (S24.0207) the concentration of toxic pollutants shall not exceed the more stringent of the continuous concentration criteria for marine waters or the human health concentration criteria for the consumption of organisms found in the most recent publication of toxics criteria in 40 CFR Part 131.36(b), as amended.

Table A3: Individual Use Support Summary for Streams (miles), 2004.

Goals	Use	Size Assessed	Size Fully Supporting	Size Fully Supporting but Threatened	Size Partially Supporting	Size Not Supporting	Size Not Attainable
Protect & Enhance Ecosystems	Aquatic Life	200.2	22.1	93.7	6.5	77.9	0.0
Protect & Enhance Public Health	Fish Consumption	-	-	-	-	-	-
	Shellfishing	-	-	-	-	-	-
	Swimming	-	-	-	-	-	-
	Drinking Water	38.4	0	0	0	38.4	0.0
Social & Economic	Agricultural	*	*	*	*	*	*
	Cultural/Ceremonial	*	*	*	*	*	*

Notes:

zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

Asterisk (*) = category not applicable

Table A4: Total Sizes of Waters Impaired by Various Cause/Stressor Categories, 2004.

Type of Waterbody: Streams

Cause/Stressor Category	Size of Waters by Contribution to Impairment (miles)	
	Major	Moderate/Minor
Cause/Stressor Unknown	-	-
Unknown Toxicity	-	-
Pesticides	-	-
Priority Organics	-	-
Non-point Organics	-	-
PCBs	-	-
Dioxins	-	-
Metals	-	-
Ammonia	-	-
Cyanide	-	-
Sulfates	-	-
Chloride	-	-
Other Inorganics	-	-
Nutrients	13.1	165
pH	-	35.1
Siltation	-	-
Organic Enrichment/low DO	39.8	86.1
Salinity/TDS/Chlorides	-	-
Thermal Modifications	*	*
Flow Alterations	-	-
Other Habitat Alterations	24.0	27.7
Pathogen Indicators	7.5	-
Radiation	*	*
Oil and Grease	-	-
Taste and Odor	-	-
Suspended Solids	-	-
Noxious Aquatic Plants (Macrophytes)	*	*
Excessive Algal Growth	-	-
Total Toxics	-	-
Turbidity	-	185.8
Exotic Species	-	-
Other (specify)	*	*

Notes: zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

asterisk (*) = category not applicable

Table A5. Total Sizes of Waters Impaired by Various Source Categories, 2004.

Type of Waterbody: Streams

Source Category	Contribution to Impairment (miles)	
	Major	Moderate/Minor
Industrial Point Sources	-	-
Municipal Point Sources	-	-
Combined Sewer Overflows	-	-
Collection System Failure	45.9	115.8
Domestic Wastewater Lagoon	*	*
Agriculture	-	-
Crop-related sources	*	*
Grazing-related sources	*	*
Intensive Animal Feeding Operations	45.9	113
Silviculture	*	*
Construction	-	-
Urban Runoff/Storm Sewers	-	-
Resource Extraction	*	*
Land Disposal	-	-
Hydromodification	-	-
Habitat modification (non-hydromod)	46.9	-
Marinas and recreational Boating	*	*
Erosion from Derelict Land	-	-
Atmospheric Deposition	-	-
Waste Storage/Storage Tank Leaks	-	-
Leaking Underground Storage Tanks	-	-
Highway maintenance and Runoff	-	-
Spills (Accidental)	-	-
Contaminated Sediments	-	-
Debris and Bottom Deposits	-	-
Internal Nutrient Cycling (Primary lakes)	*	*
Sediment Resuspension	*	*
Natural Sources	-	-
Recreational And Tourism Activities	*	*
Salt Storage Sites	*	*
Groundwater Loadings	*	*
Groundwater Withdrawal	*	*
Other Specify	-	-
Unknown Source	4.3	-
Sources Outside State Jurisdiction		*

Notes: asterisk (*) = category not applicable

dash (-) = Category applicable no data available

zero (0) = Category applicable, but size of water in category is zero

TableA6: Summary of Fully Supporting, Threatened, and Impaired Streams, 2004.

Degree of Use Support	Assessment Category		Total Assessed Size (miles)
	Evaluated	Monitored	
Size Fully Supporting All assessed Uses	-	22.1	22.1
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	-	69.1	69.1
Size Impaired for One or More Uses	-	116.2	116.2
Size Not Attainable for Any Use and Not Included in the Line Items Above	*	*	*
Total Assessed	-	207.4	207.4
Notes: zero (0) = Category applicable, but size of water in category is zero dash (-) = Category applicable no data available asterisk (*) = category not applicable			

Table A7: Individual Use Support Summary for Ocean Shoreline (shore miles), 2004.

Goals	Use	Size Assessed	Size Fully Supporting	Size Fully Supporting but Threatened	Size Partially Supporting	Size Not Supporting	Size Not Attainable
Protect & Enhance Ecosystems	Aquatic Life	42.2	14.7	27.5	0	0	0
Protect & Enhance Public Health	Fish Consumption	37.4	29.5	0	0	7.9	0
	Shellfishing	-	-	-	-	-	-
	Swimming	83.4	10.7	0	40.1	32.6	0
	Drinking Water	-	-	-	-	-	-
Social & Economic	Agricultural	*	*	*	*	*	*
	Cultural/Ceremonial	*	*	*	*	*	*

Notes:

zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

Asterisk (*) = category not applicable

Table A8: Total Sizes of Waters Impaired by Various Cause/Stressor Categories, 2004.

Type of Waterbody: Ocean Shoreline

Cause/Stressor Category	Size of Waters by Contribution to Impairment (shore miles)	
	Major	Moderate/Minor
Cause/Stressor Unknown	-	-
Unknown Toxicity	-	-
Pesticides	-	-
Priority Organics	-	-
Non-point Organics	-	-
PCBs	7.9	-
Dioxins	-	-
Metals	-	7.9
Ammonia	-	-
Cyanide	-	-
Sulfates	-	-
Chloride	-	-
Other Inorganics	-	-
Nutrients	-	27.5
PH	-	-
Siltation	-	-
Organic Enrichment/low DO	-	13.1
Salinity/TDS/Chlorides	-	-
Thermal Modifications	*	*
Flow Alterations	-	-
Other Habitat Alterations	-	-
Pathogen Indicators	64.8	7.9
Radiation	*	*
Oil and Grease	-	-
Taste and Odor	-	-
Suspended Solids	-	-
Noxious Aquatic Plants (Macrophytes)	*	*
Excessive Algal Growth	-	-
Total Toxics	-	-
Turbidity	-	5.2
Exotic Species	-	-
Other (specify)	*	*

Notes: zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

asterisk (*) = category not applicable

Table A9. Total Sizes of Waters Impaired by Various Source Categories, 2004.

Type of Waterbody: Ocean Shoreline

Source Category	Contribution to Impairment (shore miles)	
	Major	Moderate/Minor
Industrial Point Sources	-	-
Municipal Point Sources	-	-
Combined Sewer Overflows	-	-
Collection System Failure	37.5	40.1
Domestic Wastewater Lagoon	-	-
Agriculture	-	-
Crop-related sources	*	*
Grazing-related sources	*	*
Intensive Animal Feeding Operations	37.5	40.1
Silviculture	*	*
Construction	-	-
Urban Runoff/Storm Sewers	-	-
Resource Extraction	*	*
Land Disposal	-	-
Hydromodification	-	-
Habitat modification (non-hydromod)	-	-
Marinas and recreational Boating	*	*
Erosion from Derelict Land	-	-
Atmospheric Deposition	-	-
Waste Storage/Storage Tank Leaks	-	-
Leaking Underground Storage Tanks	-	-
Highway maintenance and Runoff	-	-
Spills (Accidental)	-	-
Contaminated Sediments	7.9	-
Debris and Bottom Deposits	-	-
Internal Nutrient Cycling (Primary lakes)	*	*
Sediment Resuspension	*	*
Natural Sources	-	-
Recreational And Tourism Activities	*	*
Salt Storage Sites	*	*
Groundwater Loadings	*	*
Groundwater Withdrawal	*	*
Other Specify	-	-
Unknown Source	-	5.7
Sources Outside State Jurisdiction	*	*

Notes: asterisk (*) = category not applicable

dash (-) = Category applicable no data available

zero (0) = Category applicable, but size of water in category is zero

Table A10. Summary of Fully Supporting, Threatened, and Impaired Ocean Shoreline, 2004.

Degree of Use Support	Assessment Category(miles)		Total Assessed Size (miles)
	Evaluated	Monitored	
Size Fully Supporting All assessed Uses	0	21.6	21.6
Size Fully Supporting All assessed Uses butThreatened for at Least One Use	0	5.7	5.7
Size Impaired for One or More Uses	0	56.1	56.1
Size Not Attainable for Any Use and Not Included in the Line Items Above	0	0	0
Total Assessed	0	83.4	83.4

Notes: zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

asterisk (*) = category not applicable

Table A11: Individual Use Support Summary for Wetlands (acres), 2004.

Goals	Use	Size Assessed	Size Fully Supporting	Size Fully Supporting but Threatened	Size Partially Supporting	Size Not Supporting	Size Not Attainable
Protect & Enhance Ecosystems	Aquatic Life	438.9	169.5	258.8	10.6	0	0
Protect & Enhance Public Health	Fish Consumption	*	*	*	*	*	*
	Shellfishing	*	*	*	*	*	*
	Swimming	*	*	*	*	*	*
	Drinking Water	*	*	*	*	*	*
Social & Economic	Agricultural	438.9	315.4	122.9	0.6	0	*
	Cultural/Ceremonial	438.9	307.4	122.9	8.6	0	*
	Recreational	430.3	135.4	258.8	36.1	0	*

Notes:

zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

Asterisk (*) = category not applicable

Table A12: Total Sizes of Waters Impaired by Various Cause/Stressor Categories, 2004.

Type of Waterbody: Wetlands

Cause/Stressor Category	Size of Waters by Contribution to Impairment (acres)	
	Major	Moderate/Minor
Cause/Stressor Unknown	-	-
Unknown Toxicity	-	-
Pesticides	-	-
Priority Organics	-	-
Non-point Organics	-	-
PCBs	-	-
Dioxins	-	-
Metals	-	168.5
Ammonia	-	-
Cyanide	-	-
Sulfates	-	-
Chloride	-	-
Other Inorganics	-	-
Nutrients	-	202.6
PH	-	-
Siltation	-	100.8
Organic Enrichment/low DO	-	202.6
Salinity/TDS/Chlorides	-	-
Thermal Modifications	*	*
Flow Alterations	-	-
Other Habitat Alterations	-	-
Pathogen Indicators	-	-
Radiation	*	*
Oil and Grease	-	-
Taste and Odor	-	-
Suspended Solids	-	100.8
Noxious Aquatic Plants (Macrophytes)	*	*
Excessive Algal Growth	-	-
Total Toxics	-	-
Turbidity	-	100.8
Exotic Species	-	-
Other (habitat loss)	92.8	122.8

Notes: zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

asterisk (*) = category not applicable

Table A13. Total Sizes of Waters Impaired by Various Source Categories, 2004.

Type of Waterbody: Wetlands

Source Category	Contribution to Impairment (acres)	
	Major	Moderate/Minor
Industrial Point Sources	-	-
Municipal Point Sources	-	-
Combined Sewer Overflows	-	-
Collection System Failure	-	-
Domestic Wastewater Lagoon	-	-
Agriculture	-	-
Crop-related sources	*	*
Grazing-related sources	*	*
Intensive Animal Feeding Operations	-	295.5
Silviculture	*	*
Construction	-	-
Urban Runoff/Storm Sewers	-	8.0
Resource Extraction	*	*
Land Disposal	-	-
Hydromodification	-	-
Habitat modification (non-hydromod), i.e., filling	8.0	218.3
Marinas and recreational Boating	*	*
Erosion from Derelict Land	-	-
Atmospheric Deposition	-	-
Waste Storage/Storage Tank Leaks	-	-
Leaking Underground Storage Tanks	-	-
Highway maintenance and Runoff	-	-
Spills (Accidental)	-	-
Contaminated Sediments	-	-
Debris and Bottom Deposits	-	-
Internal Nutrient Cycling (Primary lakes)	*	*
Sediment Resuspension	*	*
Natural Sources	-	-
Recreational And Tourism Activities	*	*
Salt Storage Sites	*	*
Groundwater Loadings	*	*
Groundwater Withdrawal	*	*
Other Specify	-	-
Unknown Source	-	-
Sources Outside State Jurisdiction	*	*

Notes: asterisk (*) = category not applicable

Dash (-) = Category applicable no data available

Zero (0) = Category applicable, but size of water in category is zero

Table A14. Summary of Fully Supporting, Threatened, and Impaired Wetlands, 2004.

Degree of Use Support	Assessment Category(acres)		Total Assessed Size (acres)
	Evaluated	Monitored	
Size Fully Supporting All assessed Uses	135.4	0	135.4
Size Fully Supporting All assessed Uses butThreatened for at Least One Use	258.8	0	258.8
Size Impaired for One or More Uses	44.7	0	44.7
Size Not Attainable for Any Use and Not Included in the Line Items Above	0	0	0
Total Assessed	438.9	0	438.9

Notes: zero (0) = Category applicable, but size of water in category is zero

dash (-) = Category applicable no data available

asterisk (*) = category not applicable

VII Appendix B

Figure 1. Map of Tutuila and Aunu'u, American Samoa, and the 35 watersheds that comprise the islands.

Figure 2. Map of the Manu'a Islands (Ofu, Olosega, and Ta'u), American Samoa, and the 6 watersheds that comprise the islands.

